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Enhancing avocado farming: Arka Coorg Ravi and Arka Supreme as promising varieties

Avocado is a remunerative crop gaining its significance in commercial fruit orchard by the intervention of two newly released, high-yielding avocado varieties from Central Horticultural Experiment Station, ICAR-Indian Institute of Horticultural Research, Chettalli, Kodagu District, Karnataka, India. Arka Supreme is an A-type variety released in 2020 and has a fruit weight of 400-450 g with fat content of 18-20%. Arka Coorg Ravi is a B-type variety released in 2022 which exhibits high pulp recovery with a fruit weight of 450-600 g. These varieties have the potential to enhance avocado production and increase growers' income in India, with an average yield of 80-100 kg per plant after eight years of planting.

AVOCADO (*Persea americana* Mill.) is a high-value fruit crop that has gained significant popularity in recent years. Since its origin from Mexico and Central America, it was introduced to India in the early 19th century from Ceylon. The avocado genus comprises 150 species, with the Guatemalan, Mexican and West Indian races being particularly important in horticulture. Avocados are renowned for their nutritional value, being rich in fats and other bioactive compounds. Avocados are popular in diabetic diets due to the presence of low sugar content, and are extensively used in the preparation of cosmetic products due to their high lipid content. The oil derived from avocados is similar to olive oil, primarily consisting of oleic acid, which ensures high digestibility. In India, avocado is mainly cultivated in Tamil Nadu, Kerala, Karnataka, Maharashtra and parts of North-Eastern Himalayan regions. Over the past decade, interest in commercial avocado has surged due to the delicious nature of fruits and high market value. However, availability of varieties for commercial cultivation is limited, except TKD-1. To address this, two high-yielding varieties, Arka Supreme and Arka Coorg Ravi, were developed and released for commercial production.

The ICAR-IIHR Central Horticultural Experiment Station, Chettalli released two Indian avocado varieties through systematic germplasm evaluation programme. An intensive survey conducted in 2000-2001 across hotspots in Karnataka, Kerala and Tamil Nadu led to the collection of over 40 avocado accessions. These accessions were planted and evaluated at CHES, Chettalli for over twenty years for fruit yield and quality traits. Based on the results, CHES PA III-1 and CHES PA XIII-1 were found superior and subsequently released as Arka Supreme and Arka Coorg Ravi in 2020 and 2022, respectively. Currently, these varieties are being tested at 16 centres of the country under the ICAR-All India Coordinated Research Project on Fruits.

Arka Supreme

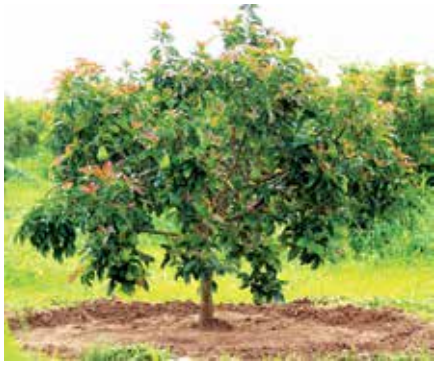
Arka Supreme is a seedling selection developed at CHES, Chettalli, and released in 2020. It is a regular-bearing variety with a high yield potential of 80-120 kg per plant. The fruits are spheroid, weighing between 400-450 g. The fruit peel colour turns from light green to purple as it matures, with pale-yellow pulp. The fruits have a total soluble solids (TSS) content of 6.5-8.0°Brix with 18-20% fat content and it exhibits A-type flowering behaviour.

Arka Supreme plant

Arka Coorg Ravi

Arka Coorg Ravi is a seedling selection developed and released in

Plant



Bearing habit

Fruits

Variety Arka Coorg Ravi

2022 at CHES, Chettalli. It is a high-yielding, regular-bearing variety with a yield potential of 80-100 kg per plant. The fruit is narrowly obovate to rhomboidal, weighing between 450-600 g. The pulp has a buttery texture with moderate sweetness and thicker pulp 2.5 cm, with a TSS content of 6.5-8.0°Brix. It also exhibits high pulp recovery (> 80%) with 12 to 14% fat. The flowering behaviour is of B type, making this variety suitable as a pollinizer for A type varieties to enhance yield.

Soil and climate

The optimal climate for avocado cultivation ranges from tropical to the warmer parts of the temperate zone. Avocado tree thrives well in a variety of soils except black soil. The avocados cannot tolerate waterlogging condition. Hence, well drained soils are ideal. The other ideal conditions include soil pH between 5.5-6.5, temperatures from 20-35°C, and annual rainfall between 1,000-1,500 mm.

Planting and propagation

Avocado is commercially propagated through softwood grafting, which has more than 90% success rate under subhumid tropical climate. It can also be propagated through chip budding and patch budding.

During April-May, pits measuring 1 cubic meter are dug and filled with a mixture of Farm Yard Manure (FYM) and top soil in equal parts (1:1) before planting. Planting can be done using either seedlings or grafts, preferably during June-July or September based on rainfall pattern. Grafts are typically planted at a spacing of 6 m × 6 m (110 plants/acre), while seedlings are planted at 8 m × 8 m (60 plants/acre) or 10 m × 10 m (40 plants/acre), depending on the vigour and growth habit of the variety.

Fertilizer management

Mature avocado plants (6 years and older) require substantial amounts of organic matter, such as FYM. The general nutrient management approach involves applying 50 kg FYM per plant, along with N: P: K (400:200:500 g/plant), that can be supplied through 700 g Urea, 450 g DAP, and 850 g MOP. These nutrients should be applied in two equal splits during the pre-monsoon (May-June) and post-monsoon (October-November) periods. Additional nutrients viz. 250 g $MgSO_4$ or 1 kg dolomite and 100 g Borox per plant can be applied in November.

Irrigation

In India, avocados are generally cultivated under rain-fed conditions, with periodic watering every two weeks during the summer months being beneficial. Intercropping with legumes or shallow-rooted annual crops in young orchards helps preserve soil moisture and reduces runoff during heavy rainfall.

Training and pruning

Pruning is very essential during initial growth stages to establish good frame work to the plant. Topping of main stem at 75-100 cm above ground level and maintaining 3-4 primary branches help maintain good canopy. The light pruning should be done every year after harvesting which involves removal of dried and dead branches, criss-cross branches. Pruning of low-hanging, ground-touching branches facilitates easier management of cultural practices. Extensive pruning has been observed to stimulate excessive vegetative growth, ultimately reducing yield.

Flowering and pollination

Avocado flowering occurs from September to November or February to March. The inflorescence forms a compound panicle with bisexual flowers which exhibit protogynous dichogamy, where the female parts develop before the male parts, which helps to prevents self-pollination. Based on flowering behaviour 'avocado' cultivars are grouped into 'A' and 'B' types. Some of the

Table 1. Flowering mechanism in A and B type varieties

Flower type	Day 1	Day 1	Day 2	Day 2
	Morning	Afternoon	Morning	Afternoon
A	Functional female	Closed	Closed	Functional male
B	Closed	Functional female	Functional male	Closed

A type varieties are Arka Supreme, Hass and Reed while, Arka Coorg Ravi, Shepard and Fuerte are B type varieties.

Avocado pollination is primarily mediated by insects, with hymenopterans being the dominant pollinators, followed by dipterans and coleopterans. The primary pollinator is *Apis cerena*, known for its peak foraging activity between 6:00 AM and 12:00 Noon.

Bearing habit

Fruits

Variety Arka Supreme

Pest and disease management

The Avocado Long-Tailed Mealy Bug is a prevalent pest found in clusters on young shoots, fruit, and fruit stalks. They feed on plant sap, often leading to the growth of black sooty mould on leaves, twigs and fruits. Management involves spraying with Thiamethoxam (0.05%) or Imidacloprid (0.05%) or Acetamiprid (0.05%).

The Avocado Leaf Roller poses another threat, with larvae constructing silk webbing on terminal leaves of young twigs, hindering twig growth. Effective control involves applying Fenvalerate (0.05%) or Quinalphos (0.2%) during the emergence of new flushes.

The Twig Borer and Shot Hole Borer cause wilting and drying of branches due to small round holes on bark and twigs. Regular removal of affected twigs, along with application of synthetic pyrethroids, helps in insect control.

Avocado leaf miner causes whitish blisters on leaf surfaces as mined areas swell and dry up. Control involves spraying Lambda-cyhalothrin 5% EC at 0.5 mL/L during new growth.

The primary diseases affecting avocado include anthracnose, root rot, leaf spot, stem rot and scab. Avocado Wilt, known as Phytophthora root rot, leads to wilting and eventual death, evidenced by pale green wilted leaves and black decayed roots. Proper drainage and soil drenching using Metalaxyl 4% and Mancozeb 64% WDG (1 g/L) with 0.5% *Trichoderma* are recommended for management.

Anthracnose caused by *Colletotrichum gloeosporioides*, results in dark sunken spots on fruits and fruit shedding. Spraying Propaconazole 25% EC (0.5 mL/L) or Hexaconazole 5% EC (0.5 mL/L) during floral bud swelling and fruit development can help prevent and control this disease.

Lastly, Avocado scab, caused by *Sphaceloma perseae* causes irregular spots on fruit's surface, resulting in deformation. The application of Propaconazole 10% EC (0.5 mL/L) or Hexaconazole 5% EC (0.5 mL/L) or Copper Oxy-chloride 50% WP (2.5 g/L) and Bordeaux mixture (1%) is effective.

Harvesting and yield

Avocado seedlings take five to six years to commence fruit production, while grafted plants begin to produce fruits within three years. In purple-skinned varieties, mature fruits transition from green to light purple, whereas green-skinned avocados change to light green or greenish-yellow as they ripen. The ripening process involves the skin becoming smoother and losing its glossy appearance. Avocados are ready for harvest when the seed coat inside the fruit changes from yellowish-white to dark brown. After harvesting, mature fruits ripen within six to ten days. Commercial yields generally commence eight years after planting and average yield is 80 – 120 kg per plant per year.

SUMMARY

The Arka Supreme and Arka Coorg Ravi have emerged as highly promising options for farmers for commercial cultivation of avocado. Arka Supreme is a purple colour high-yielding selection with high fat content (18-20%), while Arka Coorg Ravi is also a high-yielding seedling selection with high pulp recovery (> 80%). Cultivation of Arka Supreme (A type) and Arka Coorg Ravi (B type) together will help to get higher yields. These varieties can be used for commercial cultivation in states such as Karnataka, Kerala and Tamil Nadu. By adopting these superior varieties, avocado growers can expect enhanced productivity and income, driving further avocado based industrial growth nationwide.

Salient features of Arka Supreme

- Fruit weight: 370 to 420 g
- Pulp content: 60 to 70%
- Flowering habit: A type
- Fat content: 18% to 20%
- TSS: 7.8°Brix

Salient features of Arka Coorg Ravi

- Fruit weight: 450 to 600 g
- Pulp recovery is > 80%
- Flowering habit: B type
- Fat content: 12% to 14%
- TSS: 6.5 to 8°Brix

For further interaction, please write to:
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